

WHAT IS CLAIMED IS:

1. A method for deriving a three-dimensional model of a scene from a plurality of images of the scene, said method comprising the steps of:

(a) generating a plurality of three-dimensional panoramic images of a scene, wherein each three-dimensional panoramic image is derived from a plurality of range images captured from a distinct spatial position;

(b) determining transformations that align the plurality of three-dimensional panoramic images;

(c) integrating spatial information from the plurality of three-dimensional panoramic images to form a spatial three-dimensional model of the scene; and

(d) integrating intensity and texture information from the plurality of three-dimensional panoramic images onto the spatial three-dimensional model to form a three-dimensional model of the scene containing both spatial and intensity information.

2. The method as claimed in claim 1, wherein the step (a) of generating a plurality of three-dimensional panoramic images further comprises:

(a) positioning a camera at a first distinct spatial location;

(b) acquiring the plurality of range images of the scene by rotating the camera about a vertical axis relative to the scene, wherein there is an inter-overlap region between adjacent images;

(c) forming a three-dimensional panoramic image about the vertical axis from the plurality of range images acquired in step (b); and

(d) generating a plurality of three-dimensional panoramic images by repeating steps (a) through (c) at additional spatial positions in the scene.

3. The method as claimed in claim 2, wherein the camera is a scannerless range imaging camera.

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4. The method as claimed in claim 1, wherein the step (b) of determining the transformations that align the plurality of three-dimensional panoramic images further comprises:

- (a) determining one or more pairs of three-dimensional panoramic images that contain some common scene information;
- (b) determining the transformations that align each pair of three-dimensional panoramic images that contain some common scene information; and
- (c) determining global inconsistencies in the transformations found in step (b).

5. The method as claimed in claim 1, wherein the step (d) of integrating the intensity and texture information from the plurality of three-dimensional panoramic images assumes a Lambertian reflectance model.

6. The method as claimed in claim 1, wherein the step (d) of integrating the intensity and texture information from the plurality of three-dimensional panoramic images assumes a reflectance model that depends on the viewpoint of the observer.

7. The method as claimed in claim 1, wherein the three-dimensional panoramic image is a color image.

8. The method as claimed in claim 1, wherein one or more range images are juxtaposed between a pair of three-dimensional panoramic images before initiating the step (b) of determining the transformations that align the plurality of three-dimensional panoramic images.

9. A computer program product for deriving a three-dimensional model of a scene from a plurality of three-dimensional panoramic images of a scene, wherein each three-dimensional panoramic image is derived from a plurality of range images captured from a distinct spatial position; said computer

program product comprising a computer readable storage medium having a computer program stored thereon for performing the steps of:

- (a) determining transformations that align the plurality of three-dimensional panoramic images;
- (b) integrating spatial information from the plurality of three-dimensional panoramic images to form a spatial three-dimensional model of the scene; and
- (c) integrating intensity and texture information from the plurality of three-dimensional panoramic images onto the spatial three-dimensional model to form a three-dimensional model of the scene containing both spatial and intensity information.

10. The computer program product as claimed in claim 9 wherein the step (a) of determining the transformations that align the plurality of three-dimensional panoramic images further comprises:

- (a) determining one or more pairs of three-dimensional panoramic images that contain some common scene information;
- (b) determining the transformations that align each pair of three-dimensional panoramic images that contain some common scene information; and
- (c) determining global inconsistencies in the transformations found in step (b).

11. The computer program product as claimed in claim 9 wherein the step (c) of integrating the intensity and texture information from the plurality of three-dimensional panoramic images assumes a Lambertian reflectance model.

12. The computer program product as claimed in claim 9 wherein the step (c) of integrating the intensity and texture information from the plurality of three-dimensional panoramic images assumes a reflectance model that depends on the viewpoint of the observer.

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13. The computer program product as claimed in claim 9 wherein the three-dimensional panoramic image is a color image.

14. The computer program product as claimed in claim 9 wherein one or more range images are juxtaposed between a pair of three-dimensional panoramic images before initiating the step (a) of determining the transformations that align the plurality of three-dimensional panoramic images.

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